

Its song was powerful, and resembled that of the Black Ougel, but was occasionally interrupted with the harsh craking note common to many of the Warblers, and at intervals it uttered a single shrill cry.

The specimen was very fat, and when opened the testicles were found to be much enlarged; the stomach contained small beetles and flies.

From the nature of the locality, from the time when captured, and from the enlarged state of the testicles, there can be little doubt that this bird was breeding in the neighbourhood: and I have some reason for believing that the nidification of this species has occurred in another part of England. I have had in my possession for nearly two years an egg taken by a friend of mine in Northamptonshire, which agrees in every respect with Thienemann's figure and description of the egg of *Sylvia Turdoides*; and now, since the capture of the bird in Britain, it is impossible to doubt that this egg belongs to that species. It would therefore appear probable that this delightful songster, the largest of the European Warblers, may be a regular summer visitant to our island. Notwithstanding its large size it might easily pass unnoticed, skulking as it does in the low herbage, and seldom exposing itself to view. Its song, too, by most would be taken for that of the Black Ougel; and even now it might have escaped detection had not the accurate ear and experienced eye of Mr. Robson been engaged in the pursuit.

Newcastle-on-Tyne, 15th July 1847.

*On the habits of Cicada septendecim.* By S. P. HILDRETH, M.D.

It is now seventeen years since, in 1829, this curious insect appeared in this portion of Ohio. Its exit from the earth, where it had remained excluded from the light of day for so long a time, was looked for with considerable interest. They were first seen to come out of the ground on the 14th of May, 1846, ascend some bush, fence, or tree, cast off their exuvixæ, and become a flying insect. They had been observed, near the surface, since the beginning of April, and were turned up by the plough, and dug out of the earth by hogs, which were very fond of them, as were also birds, domestic fowls and cats. At a brick-yard in Marietta, where the clay was dug from the side of a hill, under the remains of an old orchard of apple-trees, the workmen observed the cells of this insect in 1838, in the large masses of earth broken off from the side of the bank. In 1840 I visited the spot, collected several of the *Cicadæ* and preserved them in spirit. Their cells at that time were measured, and found to be a third less than in the seventeenth year. The cells are oval and very smooth within; they are two and a quarter inches long and three-fourths of an inch in diameter, being sufficiently large for the single Cicada, which inhabits it, to move and turn round. Thus they dwell for sixteen years and ten months secluded in a grotto of their own construction.

After the eggs of the female are deposited in the tender branches

\* From Silliman's American Journal for March 1847.

of trees, they remain two months or sixty days in the pith of the wood before they are hatched and ready to seek their home in the earth; and as they invariably ascend in May, soon after which the eggs are deposited, it makes their actual residence in the earth two months short of seventeen years. The perfect insect lives about thirty days, and then perishes. In 1840 the cells were found to be from two and a half to four feet below the surface, and without any tube communicating with the top of the ground. The cells are probably water-proof, as the flood of 1832 covered the surface to the depth of six or eight feet in my garden. In 1846 a large number of these insects emerged from the earth under an apple-tree, in the branches of which the parent Cicada had deposited her eggs in 1829. If the water at that time, when only in their third year, had had access to their cells, they must have perished, for it remained over them five or six days. In their cells no appearance of excrementitious matter was noticed. When their period of entombment is completed, in the seventeenth year, or perhaps earlier, they commence working out a smooth cylindrical tube towards the surface, taking care not to approach within reach of frosts, and where examined for the purpose, the tubes have been found to be usually about four feet in length. For constructing their cells and excavating these tubes, their fore-feet are admirably adapted, being much larger and stronger than those for locomotion, and formed with stout claws like the crawfish. Each pupa is armed with a stout proboscis, one-fourth of an inch long, which usually lies between the fore-legs on a line with the body. A remarkable example of instinct was observed in some which came to the surface under a pile of boards, raised by timbers five or six inches above the earth. The ground was wet, and to enable themselves to reach the dry boards they continued their cylinders up to them, forming thus towers of damp clay in the centre of which they were concealed. These towers were five or six inches high and about an inch in diameter; they were constructed of lumps of wet earth compacted together in a firm but rough manner. A large number of these towers was found when the boards were removed; some had the top closed, and from these the Cicada had not departed. When they had reached the boards, they crawled along on the under side and came to the open air, where, fixing on a spot favourable to their purpose, they remained attached, until a rupture was made in the cuticle on the back of the thorax, and the perfect insects then with great effort extricated themselves from the armour that had so long protected them in the earth. As there was no further use for the stout claws of the fore-legs after they became denizens of the air, these legs were replaced by two that were small and delicate like the other four. In a few days after leaving the earth they had chosen their mates, and the female soon commenced depositing her eggs in the under sides of the tender branches of trees, by means of an ovipositor resembling an awl or punch, and continued at this for several days. The preceding year's growth of the branches of apple-trees is a favourite wood with them;—but in

the forest, the tender branches of almost any variety of wood are used for this purpose. In a few days the leaves on the twig dry up, and the punctured parts, in many instances, break with the wind and fall to the ground.

By the 21st of May they had increased rapidly, and the woods on the side hills were vocal with their music. The male is the songster, and has vibrating air-cells at the back of and under the wings. Where they are abundant their noise is deafening in the sunny and hot portion of the day, but they are nearly silent at night. About the 6th and 7th of June the weather was quite cold, which retarded their progress very much, and during a long and continued rain many of them died. They delight in heat and sunshine, moving about with great briskness. By the last of June they had nearly all perished; and, as in 1829, numbers were seen flying short distances, after the abdomen had wasted away, and separated from the wings and thorax. By the middle of August, or about sixty days after the eggs are deposited, they are hatched, and the young Cicadas are ready to enter into the earth. They prevailed over the woody region on the north of the Ohio river, from the Alleghany mountains to the Mississippi; and were full as numerous as in 1829, but will probably diminish as the forests are cut away.

Marietta, January 5th, 1847.

In continuation of this subject, which is one of general interest, we cite the following paragraphs from the very valuable work of T. W. Harris, M.D., on the Insects of Massachusetts injurious to Vegetation (pp. 171-175), referring to the work itself for a more complete history of the Cicada\*.

In those parts of Massachusetts which are subject to the visitation of this Cicada, it may be seen in forests of oak about the middle of June. Here such immense numbers are sometimes congregated as to bend and even break down the limbs of the trees by their weight, and the woods resound with the din of their discordant drums from morning to evening. After pairing, the females proceed to prepare a nest for the reception of their eggs. They select, for this purpose, branches of a moderate size, which they clasp on both sides with their legs, and then bending down the piercer at an angle of about forty-five degrees, they repeatedly thrust it obliquely into the bark and wood in the direction of the fibres, at the same time putting in motion the lateral saws; in this way they detach little splinters of the wood at one end, so as to form a kind of fibrous lid or cover to the perforation. The whole is bored obliquely to the pith, and is gradually enlarged by a repetition of the same operation, till a longitudinal fissure is formed of sufficient extent to receive from ten to twenty eggs. The side-pieces of the piercer serve as a groove to convey the eggs into the nest, where they are deposited in pairs, side by side, but separated from each other by a portion of woody fibre,

\* Report on the Insects of Massachusetts injurious to Vegetation, by Thaddeus William Harris, M.D. 460 pp., 8vo. Cambridge, 1841.

and they are implanted into the limb somewhat obliquely, so that one end points upwards. When two eggs have been thus placed, the insect withdraws the piercer for a moment, and then inserts it again and drops two more eggs in a line with the first, and repeats the operation till she has filled the fissure from one end to the other, upon which she removes to a little distance, and begins to make another nest to contain two more rows of eggs. She is about fifteen minutes in preparing a single nest and filling it with eggs; but it is not unusual for her to make fifteen or twenty fissures in the same limb; and one observer counted fifty nests extending along in a line, each containing fifteen or twenty eggs in two rows, and all of them apparently the work of one insect. After one limb is thus sufficiently stocked, the Cicada goes to another, and passes from limb to limb and from tree to tree, till her store, which consists of four or five hundred eggs, is exhausted. At length she becomes so weak by her incessant labours to provide for a succession of her kind, as to falter and fall in attempting to fly, and soon dies.

Although the Cicadas abound most upon the oak, they resort occasionally to other forest trees and even to shrubs when impelled by the necessity for depositing their eggs, and not unfrequently commit them to fruit-trees when the latter are in their vicinity. Indeed there seem to be no trees or shrubs that are exempted from their attacks, except those of the pine and fir tribes, and of these even the white cedar is sometimes invaded by them. The punctured limbs languish and die soon after the eggs which were placed in them are hatched; they are broken by the winds or by their own weight, and either remain hanging by the bark alone, or fall with their withered foliage to the ground. In this way orchards have suffered severely in consequence of the injurious punctures of these insects.

The eggs are one-twelfth of an inch long, and one-sixteenth of an inch through the middle, but taper at each end to an obtuse point, and are of a pearl-white colour. The shell is so thin and delicate that the form of the included insect can be seen before the egg is hatched, which occurs, according to Dr. Potter, in fifty-two days after it is laid, but other persons say in fourteen days.

The young insect when it bursts the shell is one-sixteenth of an inch long, and is of a yellowish white colour, except the eyes and the claws of the fore-legs, which are reddish, and it is covered with little hairs. In form it is somewhat grub-like, being longer in proportion than the parent insect, and is furnished with six legs, the first pair of which are very large, shaped almost like lobster-claws, and armed with strong spines beneath. On the shoulders are little prominences in the place of wings, and under the breast is a long beak for suction. These little creatures when liberated from the shell are very lively, and their movements are nearly as quick as those of ants. After a few moments their instincts prompt them to get to the ground, but in order to reach it they do not descend the body of the tree, neither do they cast off themselves precipitately, but running to the side of the limb, they deliberately loosen their hold and fall to the earth. It seems, then, that they are not borne to the

ground in the egg state by the limbs in which their nests are contained, but spontaneously make the perilous descent immediately after they are hatched, without any clue, like that of the canker-worm, to carry them in safety through the air and break the force of their fall. The instinct which impels them thus fearlessly to precipitate themselves from the trees, from heights of which they can have formed no conception, without any experience or knowledge of the result of their adventurous leap, is still more remarkable than that which carries the gosling to the water as soon as it is hatched. In those actions that are the result of foresight, of memory, or of experience, animals are controlled by their own reason; as in those to which they are led by the use of their ordinary senses or by the indulgence of their common appetites, they may be said to be governed by the laws of their organization; but in such as arise from special and extraordinary instincts, we see the most striking proofs of that creative wisdom which has implanted in them an unerring guide, where reason, the senses and the appetites would fail to direct them. The manner of the young Cicadas' descent, so different from that of other insects, and seeming to require a special instinct to this end, would be considered incredible perhaps, if it had not been ascertained and repeatedly confirmed by persons who have witnessed the proceeding. On reaching the ground the insects immediately bury themselves in the soil, burrowing by means of their broad and strong fore-feet, which, like those of the mole, are admirably adapted for digging. In their descent into the earth they seem to follow the roots of plants, and are subsequently found attached to those which are most tender and succulent, perforating them with their beaks, and thus imbibing the vegetable juices which constitute their sole nourishment.

They do not appear ordinarily to descend very deeply into the ground, but remain where roots are most abundant; and it is probable that the accounts of their having been discovered ten or twelve feet from the top of the ground have been founded on some mistake, or the occurrence of the insects at such a depth may have been the result of accident. The only alteration to which the insects are subject, during the long period of their subterranean confinement, is an increase of size, and the more complete development of the four small scale-like prominences on their backs, which represent and actually contain their future wings.

As the time of their transformation approaches, they gradually ascend towards the surface, making in their progress cylindrical passages, oftentimes very circuitous, and seldom exactly perpendicular, the sides of which, according to Dr. Potter, are firmly cemented and varnished so as to be water-proof. These burrows are about five-eighths of an inch in diameter, are filled below with earthy matter removed by the insect in its progress, and can be traced by the colour and compactness of their contents to the depth of from one to two feet, according to the nature of the soil; but the upper portion to the extent of six or eight inches is empty, and serves as a habitation for the insect till the period for its exit arrives. Here it remains during several days, ascending to the top of the hole in fine weather

for the benefit of the warmth and the air, and occasionally peeping forth apparently to reconnoitre, but descending again on the occurrence of cold or wet weather.

During their temporary residence in these burrows near the surface, the Cicada grubs, or more properly pupæ, (for such they are to be considered at this period, though they still retain something of a grub-like form,) acquire strength for further efforts by exposure to the light and air, and seem then to wait for only a favourable moment to issue from their subterranean retreats. When at length this arrives, they issue from the ground in great numbers in the night, and crawl up the trunks of trees, or upon any other object in their vicinity to which they can fasten themselves securely by their claws. After having rested awhile they prepare to cast off their skins, which in the meantime have become dry and of an amber colour. By repeated exertions a longitudinal rent is made in the skin of the back, and through this the included Cicada pushes its head and body, and withdraws its wings and limbs from their separate cases, and, crawling to a little distance, it leaves its empty pupa-skin, apparently entire, still fastened to the tree. At first the wing-covers and wings are very small and opaque, but, being perfectly soft and flexible, they soon stretch out to their full dimensions, and in the course of a few hours the superfluous moisture of the body evaporates, and the insect becomes strong enough to fly.

During several successive nights the pupæ continue to issue from the earth; above fifteen hundred have been found to arise beneath a single apple-tree, and in some places the whole surface of the soil, by their successive operations, has appeared as full of holes as a honeycomb. In Alabama the species under consideration leaves the ground in February and March, in Maryland and Pennsylvania in May, but in Massachusetts it does not come forth till near the middle of June. Within about a fortnight after their final transformation they begin to lay their eggs, and in the space of six weeks the whole generation becomes extinct.

Fortunately these insects are appointed to return only at periods so distant that vegetation often has time to recover from the injury they inflict; were they to appear at shorter intervals, our forest and fruit trees would soon be entirely destroyed by their ravages. They are moreover subject to many accidents, and have many enemies, which contribute to diminish their numbers. Their eggs are eaten by birds; the young, when they first issue from the shell, are preyed upon by ants, which mount the trees to feed upon them, or destroy them when they are about to enter the ground. Blackbirds eat them when turned up by the plough in fields. Hogs are also excessively fond of them, and, when suffered to go at large in the woods, root them up, and devour immense numbers just before the arrival of the period of their final transformation, when they are lodged immediately under the surface of the soil. It is stated that many perish in the egg state, by the rapid growth of the bark and wood, which closes the perforations and buries the eggs before they have hatched; and many, without doubt, are killed by their perilous descent from the trees.